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The greatest problem facing education today is the eradiction of illiteracy in our own and other countries. Teaching reading to illiterate adults is primarily a matter of establishing the proper correlation between the elements of the written language, which are unknown to them, and elements of the spoken language already in their repertoire. The immediate objectives of the present project are limited to the reading and comprehension of sentences with relatively simple structures, recognition reading of a specified number of words, and the ability to use structure and context cues to read new words that are already part of the spoken vocabulary. The principal techniques taught are word recognition, picture and verbal context, phonetic analysis, and structural analysis. The program consists of a "double track;" one track consists of reading exercises, pictures, and responses for the learner; a parallel track is for a literate helper from the same language group as the learner. It is hoped that once a format is perfected in one language it can be generalized with only slight modifications to other languages as well. An initial program is being planned with adult illiterate Negroes in the Delta region of Mississippi.

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PROGRAMING BASIC VERBAL SKILLS

John.W. Blyth, Ph. D.

The Diebold Group, Inc.

Presented at the Second Annual Convention
of the National Society for Programmed
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I. Introduction

Approximately 44 percent of the world's population is illiterate -- one and a half billion people who can neither read nor write. In the world today, illiteracy is one of the most severe handicaps an individual -- or a nation -- can suffer. The greatest challenge now facing education is the eradication of illiteracy. The most promising approach to this challenge is through programed instruction.

The Diebold Group has undertaken a literacy project to meet this challenge. This project is being conducted under the sponsorship of Tougaloo College, Tougaloo, Mississippi. The objectives of the project are to:

1. Apply the principles of programed instruction to the teaching of reading skills.
2. Develop tested instructional materials for a selected target population. The initial group selected for developmental testing is that of adult illiterate Negroes.
3. Determine the most effective methods of introduction and implementation of the materials.
4. Develop a generalized methodology for the generation of programed instructional materials for differing cultural groups.

The project will be described in the following sections:

II. The Problem

III. Selection of Objectives

IV. Definition of Reading

V. Teaching of Reading

VI. Program Format: The Double Track Program

VII. A Generalized Format

VIII. Conclusion

II. The Problem

The American dream that education and more education is the sure road to success and happiness has lost much of the golden glow it had for earlier generations. The image of the man who got to the top through long hours of study and hard work is too often replaced by the image of the skilled worker who has hit bottom because there is no longer any need for his skills. Today we face the paradox of a situation in which the relevance of our educational program is becoming less clear to individual students at a time when there is an increasingly realistic awareness of the utter necessity of improving and enlarging our entire educational program.

The plight of the uneducated and undereducated also presents a paradox. The very factors responsible for a general rise in our standard of living make it increasingly difficult for the uneducated to share in our growing affluence. As production methods gain greater efficiency, they require higher levels of skill. The opportunities for the uneducated to earn a living become fewer while the world of knowledge lies beyone their grasp. The functionally illiterate person is denied full participation in the economic, political and cultural life of our society. This

deprivation of human experience often becomes the legacy they leave their children.

The number of illiterates in this country varies depending on the definition used. One current definition of functional illiteracy is stated in terms of years of schooling. A functional illiterate is a person with less than eighth grade schooling. Based on this definition, it is estimated that there are 25 million adults -- 18years or older -- who are functionally illiterate. Of these, 3 million are completely illiterate.

Functional illiterates are in double jeopardy. They not only lack the skills necessary to obtain employment, they also lack the more basic skills necessary to participate in ordinary training and retraining programs. Our entire educational system after the lower elementary grades is based on the assumption that all students have basic verbal and number skills.

Although there are many exit points in our overall educational system, there are presently no re-entry points for functional illiterates.

Shocking enough at home, illiteracy assumes vastly greater dimensions abroad In underdeveloped countries, the great majority of the population has no access to basic or advanced education and training. In some countries the illiteracy rate runs as high as 95%.

In this country the school system is facing a major crisis created by simultaneous growth in population and the expansion of knowledge. We are finding it impossible to expand our system rapidly enough to provide the normal flow of children with high quality education. Furthermore, we have done little to meet the needs of adult education and know virtually nothing about literacy training of adults.

Mere expansion of the present educational system will not solve the problems of illiteracy A more dynamic approach is needed, an approach that will bring all the advances in educational technology to bear on the problem.

One answer to the illiteracy problem is to develop a system which minimizes the need for large centralized physical facilities, elaborate administrative machinery and a great number of trained teachers. This suggests the relevance of programed instruction It may be possible to combine the new features of programed instruction with the known methods of teaching reading skills to produce effective instructional materials aimed directly at the target population of illiterate adults Programed materials do minimize the need for facilities and trained teachers Of course, the existence of instructional materials will not by itself solve the problem of illiteracy. They must be used in a total training system. It is therefore a necessary part of a literacy project to find effective methods of using and implementing instructional material.

Reading programs must be closely related to the interests and cultural experience of the group to be instructed It is, therefore, not to be expected that a single set of materials will serve equally well for children and adults Similarly, the same materials will not be equally effective for different cultural groups. However, it is plausible to expect that the method for the development of materials for one group can be applied to the preparation of material for another group. For this reason The Diebold Literacy Project is paying special attention to the form of the program being developed for a specific target population. If the program is validated in field testing, the same form may be appropriate for other cultural groups.

III. Selection of Objectives

The first step in the development of programed material is the specification of objectives At first glance this would appear to be a superficial matter because everyone knows what verbal skills are - until they are asked to be specific.

Our project began with the general thesis that communication is the primary function of language. In the case of spoken language, communication requires the verbal skills of speaking and listening. In the case of a written language, communication requires the verbal skills of writing and decoding or interpreting written symbols. In written languages with a phonetic alphabet, this decoding of written symbols is called reading. It requires a correlation between the spoken language and the written symbols.

The term illiterate is usually applied to people who have severe deficiencies in reading and writing skills. It is assumed that they do have speaking and listening skills. Children are not thought of as illiterates when they are just beginning to learn to read and write; adults are This is an important point to note when trying to clarify our objectives. The teaching of reading and writing to children usually begins at a time when they are still developing a command of the spoken language Illiterate adults already have a functional command of a spoken language. Teaching reading to illiterate adults is thus primarily a matter of establishing the proper correlation between the elements of the written language that are unknown to them and elements of the spoken language already in their repertoire. This description is somewhat over-simplified because there may be deficiencies in command of the spoken language, particularly among the foreign born. But it is very important to distinguish the problem of teaching a preferred accent from the problem of associating written words with known spoken words.

Fortunately, the written language contains far more internal consistency than the spoken language. Even striking variations in accent between different language groups are possible with the same written symbols. The performance test for literacy should not involve a preferred pronunciation. It should require only the ability to read written materials in the spoken language needed to communicate effectively with the people in the same linguistic group in which the student lives.

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There is no absolute standard for measuring the objectives and results of a reading program. References are frequently made to grade levels as though there were a standard achievement at each level. The defects with the concept of grade level are avoided in part by using the concept of growth levels followed by the Board of Education of the City of New York.

Both concepts, the grade level and growth level concepts, are relevant for school systems in which large numbers of children make more or less standard progress through the system. The reading materials normally used in such systems are selected, organized and presented in a manner deemed appropriate to the average middle class socio-economic white urban population in the United States. These materials are not equally suitable for adult Negroes who have grown up in an entirely different socio-economic context. Similarly, the standards formulated with reference to norms in one cultural context are obviously not necessarily suitable in another cultural context.

Standards for the target population of adult illiterate Negroes cannot be formulated a priori. They can be specified with some precision only after more experience with the nature of the problem and the learning potentialities of the target population.

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IV. Definition of Reading

It is possible to select a reading objective which involves no oral response. Most reading is, in fact, done with no overt oral response. We have stated our objectives in terms of an oral response for several reasons. In the first place, our written language is basically a system of symbols for representing the spoken language. Secondly, making an oral response to written symbols provides one of the best ways to determine the existence of reading skills. And finally, the phonetic analysis of words offers one of the best techniques for learning to read new words.

We have now arrived at one part of our definition of reading skill. It is the ability to respond to written words and sentences with spoken words pronounced in conformity with the sound patterns of the language group of the learner. But this is only part of a satisfactory definition of reading. The correlation of physical sounds with physical marks is essential, but it leaves out other equally important elements in the communication process.

The nature of language and communication requires other dimensions of analysis frequently discussed under the general heading of meaning. Three major dimensions of analysis are called pragmatics, semantics and syntactics.

Pragmatics, briefly stated, is concerned with the various uses of languages. For example, language is sometimes used simply to

communicate information. On other occasions, it is used to give a direction to get something done. Another function of language which has received little or no attention in the literature is that of preventing communication. Members of an under-privileged minority group frequently develop considerable skill in manipulating language so that it conveys a totally different meaning within the group than it does when used in contacts with members of the external majority. In the latter case, the primary function of language is to minimize negative reinforcement. It is important to note this factor since it creates some difficulties in developing, using and evaluating instructional materials.

As far as our project is concerned, we are aiming primarily at the uses of language most appropriately described as the informative and practical functions of language. That is, we aim to teach reading and follow directions.

Semantics is the study of the meanings of words. Again, there are several dimensions or modes of meaning. The most familiar is the meaning relation between words and the object or objects named by those words. A second familiar mode of meaning is the relation between a word such as dog, and the characteristics that an animal must have to properly be called a dog. Thirdly, there are the meaning relations between words that are found in definitions. Finally, there are the emotional overtones associated with many words. These emotional

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associations again create special hazards in developing instructional materials. These meanings vary considerably from one cultural subgroup to another.

Syntactics is concerned with the conventions in a language system which govern the grouping of words into the larger units of meaning called sentences. For example, the four words: window, is, the and open may be arranged in one way to ask a question and another way to state information. The sentence 'Is the window open?' is quite different in meaning and function from 'The window is open.' and also from the shorter sentence 'Open the window.'

These three dimensions of meaning must be incorporated in our definition of reading. Reading is a language skill requiring appropriate oral responses to written words and the appropriate use of those words for efficient communication of meaning.

Evidence of the existence of reading skill as so defined may be found as follows, (the same four words mentioned above are used for illustrative purposes):

1. A literate person can say aloud each word in a specified word list. In our example, the words, listed alphabetically, are: is, open, the, window.

2. A literate person can respond to a sentence, containing a command by reading the sentence and then performing the appropriate action. If the sentence were 'Open the window,' he would do so. If he tried to open the door, or did nothing at all, he would not have understood the word 'window' and perhaps the structure of the command.
3. A literate person can respond to a question by providing the correct answer. If the question were 'Is the window open?' he would answer 'The window is (or is not) open.'
4. A literate person does not merely read a sentence as though it were a list of words randomly arranged on a line. He groups words together to form larger units of meaning.

There is another element of reading skill which we have not yet specified. We could define our objectives by specifying a word list and a sentence list of finite length and then undertake to teach appropriate responses to all these words and sentences. However, we expect a literate person to possess a greater skill than matching a learned response to a particular word or sentence stimulus. We expect him to be able to respond equally well to appropriate combinations of familiar words in sentences which do not appear in the original sentence list.

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To a limited extent, we also expect a literate person to be able to pronounce some unfamiliar words. Similarly, he should be able to deduce their meaning from their structure and the context in which they occur.

The immediate objectives of the present project are limited to the reading and comprehension of sentences with relatively simple structures, recognition reading of a specified number of words and the ability to use structure and context clues to read new words that are already a part of the spoken vocabulary.

V. The Teaching of Reading

Reading experts are not always in agreement about methods used to teach reading. The basic approach followed in our project is similar to that used in the Sheldon reading series and recommended by Dr. William Sheldon, Director of the Reading Clinic of Syracuse University.

Reading is a complex skill. The full development of that skill requires the use of a number of different sub-skills. Various techniques are appropriate for different sub-skills. The principal techniques are word recognition, picture and verbal context, phonetic analysis and structural analysis.

As previously noted, our written language is an organized body of written symbols correlated with a meaningful sound system. Our target population is illiterate adults with an existing command of a spoken language -- or an organized sound system.

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The problem, then, is to transfer the learner's skill of sound organization to interpretation of the written symbol. To achieve this, we must begin by drawing attention to geometric shapes and forms. This relates to the reading readiness exercises initially given to children. Soon the student receives practice in word recognition through configuration discrimination.

When the student is ready, the association between written words and the spoken words that are already part of his active vocabulary is established. Some of these words -- the articles, conjunctions, prepositions and pronouns will form a basis for the learner's sight vocabulary; that is the words that the student will eventually read without the help of supporting context words or sound or picture cues. Since these words are common to all written language, they are automatically reviewed in subsequent lessons. Common nouns, since they can be selectively introduced in the program through the use of representative pictures, can themselves be used to teach a basic structural vocabulary for most sentences. For example, we can use the word 'man' to teach articles, state-of-being verbs and numerous adjectives in sentences like 'The man is fat.' We can use the word 'man' again to teach prepositions in such sentences as 'The man is in the room.' Similar techniques can be used to teach pronouns and possessive pronouns. This method uses the structure of the sentence to provide meaningful context. The aim here is to retain picture cues until the learner is well acquainted with word order and logical sentence structure.

At this point, the finer analytic skills in phonetics and individual word structure can be developed. Only when words are conceived in the learner's experience to exist in the same organized form (i.e. whole sentences) as his spoken vocabulary, will they carry enough weight to be isolated from the sentence and analyzed in terms of their various letter and sound components.

We are dealing with illiterates, who, though they may not thrive in our society, have nevertheless survived. In attempting to build whole sentences into the program as soon as possible, we are also trying to provide the student with an immediate measure for his own progress. Beginning reading, in this case, might be defined as "getting at the meaning" of words in print. For the adult illiterate this provides the real motive for exertion, and a strong framework for substantial reinforcement.

VI. Program Format - The Double-Track Program

Development of reading skill requires the learner to say words out loud. If he is to learn, he must have confirmation. Someone must assess his spoken response and tell him that he is correct. In ordinary teaching situations, the needed confirmation is supplied by the teacher. One objective of our project is to devise a method which will minimize the need for formal classroom work and trained teachers. To deal with this problem, we have developed a double-track program.

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One track of the program is, of course, for the learner. The other track running parallel to the first is for a literate helper from the same language group as the learner. Each frame contains a section of instructional material for the learner. Where it is needed, a frame also contains a direction to be read by the literate helper. The helper's role is programed exactly as the learner's activities.

There are many frames and indeed whole lessons in the program which require only visual discriminations without oral responses. For these frames and lessons the helper is not needed. At some point in the program the directions read by the helper will become the content to be learned. The learner can then become relatively independent of the helper and can eventually serve as a helper for someone else.

The double-track program requires double testing. The learner's track must be tested and revised on the basis of an analysis of the type of error elicited by the stimulus part of the frame.

The helper's track must also be tested, although in a different way. The helper leaves no written record of what was said or done. Since the objectives of this program is to have him be an effective tutor, testing of the helper's program is measured in terms of the student's behavior. Close attention is paid to the interaction between helper and learner. We make the necessary observations through personal

observation, tape recordings and 8 mm. sound films of the testing situation. Just as the learner's track has undergone many revisions, so has the helper's.

The first version of the program to be tested had directions for the helper, to be read by him silently, and directions for the learner, to be read by the helper out loud. Unfortunately, the helpers uniformly read all the words out loud. The result, of course, was confusion. This problem was solved by writing the directions so that all words were read out loud with the directions to helper incorporated so that he would read out loud what action he was to perform (e.g. "Listen. I will say a word -- 'the'. Read each word you see on the page out loud. Make a line under the word 'the' when you find it. I will tell you if you are right.")

It is possible that part of the helper's track could be provided through the use of records and tapes. This possibility was carefully considered. However, several reasons led to adoption of the double-track method.

1. Variations in dialect are so great that a recording for one under-privileged group would be unsatisfactory for another linguistic sub-group.

2. A recording cannot provide a satisfactory confirmation. The learner would have to make a comparison between his own pronunciation and the pronunciation presented on the record. To train him to make accurate judgments would require extending the program for this purpose. In a program with the objective of developing a preferred pronunciation, extra training in auditory discrimination would be desirable and perhaps necessary. The objectives for this project are more limited though still ambitious. We are aiming at communication within the same language group.
3. The people with the greatest literacy problem are usually under-privileged and are frequently located in backward areas. Even simple machinery is more expensive than printed programs.
4. The use of printed materials will facilitate their use in the home in rural areas where facilities, teachers and transportation are lacking.
5. The experience with the program to date indicates that both learner and helper obtain positive satisfactions from the cooperative arrangement.

further developments and modifications.

VIII. A Generalized Format

A program of the type we are developing must be based on the vocabulary and the cultural experience of a given language group. We do not yet know to what extent the same program can be used effectively with different groups. The use of helpers from the same language group should overcome difficulties due to variations in vocabulary, in meanings for the same words and, especially, in emotional overtones.

Once an effective program has been developed for one group, it can be tested on other groups. Differences in results will indicate needed modifications. They may also shed new light on cultural variations. In other words, a program with known characteristics may turn out to be a valuable research tool in studying social and linguistic phenomena.

A program in English cannot be simply translated into a foreign language with the expectation that it will work equally well in translated form. However, it is at least plausible to expect that the general form of a program could be adapted to other language

contexts. With the aim of developing such a generalized form, we are making an analysis of our program and abstracting a formal pattern which should simplify the process of developing new programs for other cultural groups.

The chart shown in fig. 2 shows an analysis of the major elements in the frames illustrated in fig. 1 . The stimulus part of a frame may contain two types of visual material -- pictures and words. The directions read by the helper constitute an auditory stimulus. In later frames the learner will be asked to say certain words and then respond to some characteristics of the sounds he makes. His own words then become part of the auditory stimulus. There are two possible types of response -- oral and written. And finally, the confirmation part of a frame may consist in printed matter for the learner to use or in oral comments from the helper.

The lesson from which the illustration was drawn has the objective of developing sight recognition of new words. By abstracting the specific content in the chart for specific words, we obtain a generalized form which can be used for generating additional programs introducing new vocabulary at a certain level of skill development.

The different techniques used in teaching reading will, of course, require different types of frames and different sequences. But once

PROGRESSION OF FRAMES

STIMULUS				RESPONSE		REINFORCEMENT	
VISUAL		AUDITORY		SUBJECT		SUBJECT COMPARES	HELPER SAYS
PICTURE	WORDS	HELPER	SUBJECT	MARKS	SAYS		
	cat	READS DIRECTION		WORD	WORD	CORRECT MARK	"GOOD" OR CORRECTS
	cat	DIRECTIONS		PICTURE	WORD	CORRECT MARK	"GOOD" OR CORRECTS
	cat dog	DIRECTIONS		WORD	WORD	CORRECT MARK	"GOOD" OR CORRECTS
	cat dog			WORDS			"GOOD"

STANDARDIZED SEQUENCE

	STIMULUS				RESPONSE		REINFORCEMENT	
	VISUAL		AUDITORY		SUBJECT		SUBJECT	HELPER
	PICTURE	WORDS	HELPER	SUBJECT	MARKS	SAYS	COMPARES	SAYS
1.	A	A	1, A		A	A	A	"GOOD" OR CORRECTS
2.	B	B	1, B		B	B	B	"GOOD" OR CORRECTS
3.	A, B	A	11, A		A	A	A	"GOOD" OR CORRECTS
4.	A	A, B	111, A		A	A	A	"GOOD" OR CORRECTS
5.	A, B	B	11, B		B	B	B	"GOOD" OR CORRECTS
6.	B	A, B	111, B		B	B	B	"GOOD" OR CORRECTS
X		A, B	IV			A, B		"GOOD" OR CORRECTS

LETTERS = WORDS TO LEARN
NUMBERS = CODED DIRECTIONS

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an effective form has been developed for a specific technique, that form can be used to generate additional frame sequences of the same type.

The abstraction of the formal elements in frames and sequences serves a double purpose. As mentioned earlier, it will serve as a model for the generation of instructional materials for different cultural groups. It is to be expected that the model itself may require some modification to meet various cultural requirements. Nevertheless, the adaption of a workable model will speed the process of developing effective programs in new cultural environments.

A second purpose served by the generalized format is that of increasing the efficiency of a team approach. A program adapted to the cultural needs of a group requires the combined skills of reading experts, programing experts and people thoroughly familiar with the vocabulary and cultural environment of the target population. The reading expert contributes his knowledge of the effective teaching techniques and a desirable sequence for the elements in the program. The person familiar with the cultural environment makes sure that the suggested materials are relevant, interesting and appropriate. The programing expert creates a behavioral analysis of reading skills, applies programing theory to the shaping of the learner's knowledge, determines effective frame types and sequences, analyzes test performance and coordinates information received from his consultants. The actual generation of the specific programs is then a relatively simple production problem.

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VIII. Conclusion

There are many problems still to be solved and a great amount of work still to be done before we can report that a group of adult illiterates have been taught to read with our program.

The positive results we can report at this half-way stage in our pilot project are the following:

1. Many of the teaching methods used successfully by classroom teachers can be adapted to programed instruction with a double-track system. For example, the technique of having the learner identify two or more words with the same initial consonant and the same initial sound, can be used to develop skills in phonetic analysis.
2. A person from the same language group as the learner can be used effectively as a helper. The helper must, of course, have basic reading skills but he need not have had prior training in the teaching of reading. The teachers' instructional techniques are in a large measure built into the program.
3. The use of helpers from the same language group as the learner avoids many of the problems related to regional dialects. This program is based on the assumption that an adult illiterate has command of a

spoken language, and the objective of the program is to teach him to associate printed words with that language. If the spoken words were presented on tape in a preferred dialect, the learner would have a double learning task. With a helper from his own language group, the learner hears only familiar sounds. He does not have to learn a new pronunciation while trying to learn to read written symbols.

4. The attention and interest of an illiterate can be maintained for at least an hour. Longer periods have not been tried.

5. At the start of the programed instruction movement, it was expected that success in making accurate responses would be highly motivating. In many cases this has not been true. The adult illiterate, however, has usually had many frustrating learning experiences. It appears in our testing to date that success in making correct responses is positively reinforcing. It is interesting to note that some learners tend to make a second response by saying "that's right" when they learn they have responded correctly.

6. The creation of lessons introducing new materials may be systematized by developing a generalized pattern, or sequence of frames for specific types of learning problems. For example, when a sequence of frames has been proven effective for the introduction of new vocabulary words, a similar sequence may be used for subsequent vocabulary building. The generalized format which can be developed in this manner promises to speed up the process of adapting this method of instruction to attack the problem of illiteracy in other cultures.

During the remaining months of the pilot project, we expect to make further progress toward the solution of some of the major problems in teaching illiterates how to read. In particular, the field test planned for the summer of 1964 will provide some evidence regarding several problems.

-- What is the average length of time one can expect an illiterate to work continuously?
-- What is the best spacing of study periods?
-- How much repetition needs to be built into the program to insure retention?
-- Can the study be done effectively and regularly in the home?

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-- How much group activity is required or desirable?

-- What motivational problems are involved in recruitment for, and continuation in, a study course?

-- What supporting activities are required to facilitate learning and maintain interest in a reading program?

Some of the further steps which should be taken after the completion of the pilot project are now clear.

A complete course leading the learner to the stage of independent reading will require more instructional materials than can be developed during the pilot project. The exact amount cannot be predicted. It is anticipated that a minimum of 150 to 200 hours of programed study will be required, together with other related reading activities. It should be noted, however, that a fairly large percentage of advanced lessons can be made completely self-instructional. The helper will be required only where new phonetic elements are introduced.

The program is being developed with the adult illiterate Negroes in the Delta region of Mississippi as the primary target population. When the program has been demonstrated to be effective with the initial target population, it must be tested with other regional groups. The use of a helper from the same language group should make the program relatively independent of variations in dialect. The program will probably not be equally independent of regional variations in cultural characteristics

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and economic interests. An illiterate in a depressed coal mining region will not have the same interest in a cotton picking machine as a Negro in the Delta region. Only field testing will determine whether the same program will function effectively in different regions or whether the program will have to be modified to meet regional interests.

Reading skills developed and used solely in a training context still leave the learner largely out of communication with the society through the printed word. It will be necessary to develop supplementary reading materials and activities to help make a transition from a carefully controlled learning situation to an operational use of reading skills in normal daily life.

The reading program should be coordinated with a program designed to develop other communication skills. In further stages of development the basic literacy program should lead to related vocational training courses.

Illiteracy is at the heart of the unemployment and poverty problems of our society. The development of communication skills will not, of course, solve our economic problems. But basic verbal and number skills are a minimum prerequisite for citizens to participate actively in carrying out their responsibilities and in taking advantage of opportunities as they arise.

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